General

Guideline Title

ACR Appropriateness Criteria® acute onset flank pain — suspicion of stone disease (urolithiasis).

Bibliographic Source(s)

Coursey Moreno C, Beland MD, Goldfarb S, Harvin HJ, Heilbrun ME, Heller MT, Nikolaidis P, Preminger GM, Purysko AS, Raman SS, Taffel MT, Vikram R, Wang ZJ, Weinfeld RM, Yoo DC, Remer EM, Lockhart ME, Expert Panel on Urologic Imaging. ACR Appropriateness CriteriaÂ® acute onset flank pain - suspicion of stone disease (urolithiasis). Reston (VA): American College of Radiology (ACR); 2015. 11 p. [82 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Coursey CA, Casalino DD, Remer EM, Arellano RS, Bishoff JT, Dighe M, Fulgham P, Goldfarb S, Israel GM, Lazarus E, Leyendecker JR, Majd M, Nikolaidis P, Papanicolaou N, Prasad S, Ramchandani P, Sheth S, Vikram R, Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® acute onset flank pain -- suspicion of stone disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2011. 7 p. [70 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Acute Onset Flank Pain — Suspicion of Stone Disease (Urolithiasis)

Variant 1: Suspicion of stone disease.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis without contrast	8	Reduced-dose techniques are preferred.	☢☢☢☢
CT abdomen and pelvis without and with contrast	6	This procedure is indicated if CT without contrast does not explain pain or reveals an abnormality that should be further assessed with contrast (e.g., stone versus phleboliths).	☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative**

Radiologic Procedure	Rating	Comments	RRL*
US color Doppler kidneys and bladder retroperitoneal	6		O
X-ray intravenous urography	4		☢☢☢
MRI abdomen and pelvis without contrast	4	MR urography.	O
MRI abdomen and pelvis without and with contrast	4	MR urography.	O
X-ray abdomen and pelvis (KUB)	3	This procedure can be performed with US as an alternative to NCCT.	☢☢
CT abdomen and pelvis with contrast	2		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Recurrent symptoms of stone disease.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis without contrast	7	Reduced-dose techniques are preferred.	☢☢☢☢
US color Doppler kidneys and bladder retroperitoneal	7	This procedure is indicated in an emergent setting for acute management to evaluate for hydronephrosis. For planning and intervention, US is generally not adequate and CT is complementary as CT more accurately characterizes stone size and location.	O
CT abdomen and pelvis without and with contrast	6	This procedure is indicated if CT without contrast does not explain pain or reveals an abnormality that should be further assessed with contrast (e.g., stone versus phleboliths).	☢☢☢☢
X-ray abdomen and pelvis (KUB)	5	This procedure can be performed with US as an alternative to NCCT.	☢☢
MRI abdomen and pelvis without contrast	4	MR urography.	O
MRI abdomen and pelvis without and with contrast	4	MR urography.	O
CT abdomen and pelvis with contrast	2		☢☢☢☢
X-ray intravenous urography	2		☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Pregnant patient.

Radiologic Procedure	Rating	Comments	RRL*
US color Doppler kidneys and bladder retroperitoneal	8		O
CT abdomen and pelvis without contrast	6		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation**

Radiologic Procedure	Rating	Comments	RRL*
contrast CT abdomen and pelvis without and with contrast	2		☢☢☢☢
CT abdomen and pelvis with contrast	2		☢☢☢☢
X-ray abdomen and pelvis (KUB)	2		☢☢
X-ray intravenous urography	1		☢☢☢
MRI abdomen and pelvis without and with contrast	1		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Urinary tract stones are thought to result from either excessive excretion or precipitation of salts in the urine or a relative lack of inhibiting substances. Men are more commonly affected than women, and the incidence increases with age until age 60. Children are affected less frequently. Stones tend to be recurrent, and flank pain is a nonspecific symptom that may be associated with other entities; therefore, evaluation with imaging is recommended at the initial presentation.

A stone small enough to pass into the ureter may cause blockage of urine flow with distension of the upper urinary tract. Ureteral hyperperistalsis occurs, resulting in acute onset of sharp, spasmodic flank pain. Irritation of and trauma to the ureter may also result in hematuria. The ureter contains several areas where stones commonly become lodged (e.g., at the ureteropelvic junction, the iliac vessels, and the ureterovesical junction). The probability of spontaneous passage of a stone is size dependent, and the probability is inversely proportional to stone size. A meta-analysis yielded an estimate that a calculus ≤5 mm has a 68% probability of spontaneous passage. A 10-mm stone, however, is very unlikely to pass spontaneously. Therefore, the treating physician wants to know the size of the stone as well as its location.

Overview of Imaging Modalities

Presently, noncontrast computed tomography (NCCT) is commonly performed in the evaluation of patients with suspected renal colic. NCCT is highly accurate for the identification of stones, for detecting evidence of ureteral obstruction, and for the identification of other potential etiologies of flank pain. The major disadvantage of NCCT is radiation exposure to the patient. In patients with known urolithiasis and/or a presentation classic for renal colic, the combination of abdomen and pelvis radiography (KUB) and ultrasound (US) may be an acceptable and lower-radiation alternative for the diagnosis of clinically significant stones. Magnetic resonance imaging (MRI) is an excellent tool for the evaluation of hydronephrosis though is limited in its ability to detect small stones.

Discussion of Imaging Modalities by Variant

Variant 1: Suspicion of Stone Disease

Computed Tomography

Since the introduction of the use of helical (spiral) NCCT as the initial study in evaluating flank pain, numerous investigations have confirmed it to be the study with the highest (>95%) sensitivity and specificity for urolithiasis. Virtually all stones are radiopaque on computed tomography (CT), and stone size can be measured accurately in cross-section, aiding in predicting outcome. Stone location, accurately depicted by NCCT, has also been associated with spontaneous stone passage rates, with the more proximal stones having a higher need for intervention. Review of coronal reformations has also been shown in 2 studies to increase the rate of detection of stones when reviewed with the axial dataset but was found to be equivalent to the axial dataset in 1 study. Estimation of maximal stone size was also improved by using coronal reformations. Accuracy of stone measurement is improved with bone windows and magnified views. Because urologic management is based on maximal stone diameter, stone measurements should be provided in the coronal and axial plane.

Concerns over radiation exposure, especially in young stone patients, have led to the development and evaluation of reduced-dose CT regimens. If CT is being performed to evaluate for renal or ureteral stones, a low-dose protocol should be performed. Techniques for lowering dose include using a lower kVp, lower tube current, use of automated tube current modulation, and use of iterative reconstruction. Limiting scan range to include

only the kidneys, ureters, and bladder also reduces dose. In a recent study of adults, the mean radiation dose was found to be 1.9 mGy with a low-dose protocol as compared to 9.9 mGy for a conventional protocol with similar diagnostic accuracy. Tube currents as low at 40 mA are acceptable for stone detection in pediatric patients weighing ≤50 kg.

A meta-analysis of 7 studies assessing the diagnostic performance of low dose (<3 mSv) CT for detecting urolithiasis found a pooled sensitivity of 97% and a pooled specificity of 95%. Sensitivity for stone detection decreases with smaller stone size. Sensitivity for small stones can be further hampered with increasing dose reduction. However, using moderate dose reduction (50%) with iterative reconstruction is not inferior to full-dose scans reconstructed with filtered back projection in stone detection. Low-dose CT has also been shown to yield equivalent stone measurements as compared to standard-dose CT.

If there is uncertainty about whether a calcific density represents a stone or a phlebolith at NCCT, intravenous contrast material can be administered and excretory phase images obtained for definitive diagnosis. Secondary signs such as ureteral dilatation and perinephric stranding allow CT to make a diagnosis of a recently passed stone. NCCT is also reliable for diagnosing flank pain due to causes other than ureterolithiasis, such as appendicitis and diverticulitis. CT abdomen and pelvis performed with intravenous contrast material is 81% sensitive for detection of all renal stones and >95% sensitive for detection of stones ≥3 mm.

Dual-energy CT has been shown to be a useful tool for the characterization of stone composition, though the best energy levels for imaging and postprocessing algorithm remain to be determined. Preliminary investigations also indicate that virtual unenhanced images obtained using dual-energy techniques are reasonably accurate in subtracting excreted contrast material from renal collecting systems and can be used to diagnose stones >2.9 mm with good reliability. However, virtual unenhanced images created using dual-energy techniques are thought to not be accurate enough to currently replace true unenhanced images.

Radiography

Radiography may suggest the etiology for renal colic if a calcification is visible in the expected location of the ureter on the side of the patient's pain. However, not all stones are visible at radiography. Additionally, some calcifications visible at radiography may not be in the ureter but may be phleboliths or other vascular calcifications. Also, the sensitivity of the KUB for ureterolithiasis varies depending on a number of factors, including stone composition, location, and size, as well as patient body habitus and overlying bowel contents. When compared to NCCT as the reference standard, a group of researchers found digital radiography to be 72% sensitive for large (>5 mm) stones in the proximal ureter but only 29% sensitive overall for the detection of stones of any size in any location. Another group also correlated KUB findings with NCCT findings retrospectively and found a sensitivity of 59% for detecting stones on KUB.

Radiography exposes the patient to less radiation as compared to CT. The effective radiation dose from a single abdominal radiograph is approximately 0.8 mSv as compared to 10–12 mSv for conventional NCCT of the abdomen and pelvis and 3–4 mSv for low-dose NCCT of the abdomen and pelvis. However, multiple radiographs can reach an exposure range similar to a low-dose CT. For example, a KUB with bilateral oblique views results in an effect radiation dose of approximately 2.4–2.7 mSv.

Ultrasound

US can be a useful tool in the evaluation of patients with suspected renal colic and does not expose the patient to ionizing radiation. US may be able to visualize a stone as well as demonstrate findings of obstructive uropathy.

In the setting of acute flank pain and with meticulous technique, US has been shown to be 61% to 90% sensitive for the detection of stones. Using color Doppler imaging to assess for the twinkle artifact may improve the ability to detect stones. The twinkle artifact is visible as an intense multicolored signal behind a stone with the use of color Doppler technique. However, the sensitivity of US as compared to NCCT for detecting stones overall can be quite low, ranging from 24% to 57%, and is especially poor for small stones.

US has been found to be up to 100% sensitive and 90% specific for the diagnosis of ureteral obstruction in patients presenting with acute flank pain. US findings of obstructive uropathy include hydronephrosis, ureterectasis, and perinephric fluid. However, within the first 2 hours of presentation, these findings are less sensitive because, for example, hydronephrosis may not have had time to develop.

Outcomes were similar but radiation exposure was lower when individuals with suspected nephrolithiasis who presented to the emergency department were evaluated initially with US as compared to CT in a recent randomized study of 2759 individuals. In this large study, there were no statistically significant differences in return emergency department visits, hospitalizations, or high-risk diagnoses with complications for individuals whose initial imaging workup began with US (performed as point-of-care imaging in the emergency department or performed in the radiology department) as compared to individuals whose initial imaging workup began with CT. Of note, 27% to 41% of patients who initially underwent US then underwent a subsequent CT during the initial emergency department visit, and men weighing >285 lb, women weighing >250 lb, and individuals undergoing hemodialysis were excluded from the study. Additionally, US and CT were considered true positives only if a stone was

removed or passed as reported by the patient, and this reference standard likely underestimates the presence of urinary stone burden.

A combination of an abdominal radiograph and US can be considered as a lower-radiation and less expensive alternative to NCCT for the evaluation of individuals with suspected renal colic. Though the combined use of these modalities is not as sensitive for stones (especially small stones) as compared to NCCT, a number of authors have come to the conclusion that these 2 modalities are accurate enough in the detection of clinically significant stones that KUB/US should be an acceptable alternative to NCCT for some patients. In a prospective study of 66 patients, the KUB/US combination had a sensitivity of 79% (versus 93% for NCCT) for detecting stones. All missed cases had spontaneous stone passage, leading the authors to conclude that after a negative KUB/US combination, NCCT would not add useful information. The authors suggest the use of NCCT in patients who fail to respond to conservative management or in those for whom surgery is anticipated.

Advantages of US are its lack of ionizing radiation and its ability to demonstrate some stones. Its disadvantages include the need for skilled personnel, its inability to accurately measure the size of the stone, the need to observe the ureteral jet phenomenon at the ureterovesical junction, and its inability to differentiate dilatation without obstruction from true obstruction.

Magnetic Resonance Imaging

MRI can be considered as an alternative to low-dose NCCT in certain patient populations, such as pregnant women (noncontrast MRI), young individuals, and individuals who have undergone multiple prior CT examinations. In general, MRI is highly accurate for the diagnosis of hydronephrosis and perinephric edema but is less accurate in directly visualizing stones as compared to NCCT.

One study applied magnetic resonance urography (MRU) to the evaluation of 23 patients with acutely obstructed kidneys. The study found 100% sensitivity for diagnosing obstruction, with perirenal fluid seen in 21 of 23 obstructed kidneys (87%) and in no normal kidneys. The site of the obstruction was seen in 80% of these obstructed kidneys. Round signal voids corresponding to the location of stones on correlative intravenous urogram (IVU) were seen in 12 of 18 patients with ureteric obstruction caused by a stone. Another study examined 60 patients with obstructive uropathy. In the 13 patients with stones, MRU correctly identified the site of obstruction in 12 (1 stone moved between the MRU and confirmatory imaging). Forty-six percent of the stones were seen as signal voids against a background of bright urine on T2-weighted images. A more recent study found that MR-visible stones measured an average of 1.1 cm (range, 0.15–3.3 cm), and stones not visible at MR measured an average of 0.46 cm (range, 0.1–0.9 cm). An additional study found increased oxygen content in the renal cortex and medulla with acute unilateral renal obstruction using blood oxygen level-dependent MRI. Diffusion-weighted imaging has also been shown to detect changes in renal perfusion and diffusion in the setting of acute ureteral obstruction. Another group of researchers found a higher sensitivity for detecting stones with excretory MRU as compared to T2-weighted MRU, although the former technique is not recommended for pregnant patients.

Intravenous Urography

The IVU is the previous standard study for ureterolithiasis. It provides information regarding site and degree of obstruction, stone size, and effect of obstruction on renal excretion. Nephrotomography may be useful to help distinguish renal calculi from intestinal contents. IVU has a number of relative contraindications, including renal insufficiency, dehydration, past reaction to iodinated contrast agents, and pregnancy. The availability of nonionic iodinated contrast material has reduced the risk of reaction. It may take several hours for excretion to occur in the presence of acute obstruction, in which case IVU is more time-consuming than the alternative techniques. Another disadvantage of IVU is its inability to identify alternative diagnoses.

Variant 2: Recurrent Symptoms of Stone Disease

The patient with known urolithiasis and recurrent symptoms also presents a challenge. In this setting, the likelihood of urolithiasis as the cause of flank pain is higher, but repeated NCCTs raise a concern about excessive radiation exposure. One group of authors examined the issue of radiation exposure associated with repetitive NCCTs in this setting. In a 6-year period, 5564 NCCTs were performed for renal colic. Although the vast majority of patients (96%) underwent 1 or 2 NCCTs, with an estimated effective dose of 6.5–17 mSv, 176 patients had 3 or more NCCTs, with an estimated dose of 20–154 mSv. One patient had 18 NCCTs over the 6 years.

An additional study of this problem was published in the emergency medicine literature. In this retrospective study of 356 patient encounters representing 306 individuals seen in the emergency department over a period of 10 months for suspected renal colic, 262 encounters included NCCT. Although 49 of the patients did not undergo CT scanning, 14 had 1 NCCT, 151 (49%) had 2 NCCTs, and 92 had 3 or more NCCTs in the emergency department. This final group included a 28-year-old woman with 14 scans, a 42-year-old woman with 22 scans, and a 53-year-old man with 25 scans. In this setting, every effort should be made to use a low-dose technique if NCCT is required.

Further, if the patient has persistence of symptoms from a documented stone and repeat imaging is contemplated, a limited NCCT of the area of the stone through the bladder could be considered if stone passage is the main question. Alternatively, if the stone can be seen by KUB, a repeat KUB might provide useful information at a much lower dose. KUBs can be used to follow stones that are visible on the scout radiograph of a CT.

Stones that are not visible on the CT scout radiograph may not be visible on a follow-up KUB. However, larger stones (>9.7 mm) may be visible on follow-up KUBs in thin patients, depending on stone composition, even if the stone is not visible on the CT scout radiograph.

If an individual with known urolithiasis presents with recurrent symptoms of stone disease, US is a relatively inexpensive and radiation-free option to evaluate for hydronephrosis indicating ureteral obstruction. Additionally, individuals with known renal stones may have prior imaging demonstrating the number and location of their renal stones. KUB can then be used to assess overall stone burden and to evaluate for stones that have moved, though depending on their size and composition, some stones may be difficult to identify on KUBs.

Variant 3: Pregnant Patient

Stones can be a source of abdominal pain in pregnant patients. US is frequently used as a screening examination, as US is a sensitive and specific test for diagnosing hydronephrosis and does not expose the patient or fetus to ionizing radiation. However, the differential diagnosis of hydronephrosis in the pregnant patient is confounded by physiologic hydronephrosis of pregnancy, which is thought to be caused by compression of the ureters between the gravid uterus and the linea terminalis. Physiologic hydronephrosis of pregnancy occurs in >80% of pregnant women, more commonly occurs on the right than the left, and is generally seen beginning in the second trimester.

Low-dose NCCT has been shown to be a sensitive and specific test for diagnosing stones in pregnant patients. With a goal of avoiding irradiation of the fetus, MRU has also been advocated for the detection of ureteral calculi at some centers. However, in one study in nonpregnant patients, the site of stone impaction was identified by NCCT in 146 of 146 renal units (100% sensitivity) and by MRU in only 101 of 146 renal units (69% sensitivity). A recent survey of academic medical centers found that radiologists are more likely to image for suspected renal calculus with CT than with MR in the second (35% versus 20%) and third (48% versus 18%) trimesters.

Summary of Recommendations

- NCCT is the most accurate technique for evaluating flank pain.
- Low-dose NCCT should be performed when evaluating for renal or ureteral stones.
- If there is uncertainty about whether a calcific density represents a ureteral stone or a phlebolith, intravenous contrast material can be administered and excretory phase images obtained for definitive diagnosis.
- In pregnant patients with flank pain, US is the best initial study.
- Abdominal radiography combined with US may be able to diagnose most clinically significant stones and should be considered, especially in young patients and those with known stone disease.
- MR could be considered to evaluate for hydronephrosis though is less accurate for the direct visualization of renal and ureteral stones.

Abbreviations

- CT, computed tomography
- KUB, kidneys-ureter-bladder
- MR, magnetic resonance
- MRI, magnetic resonance imaging
- NCCT, noncontrast computed tomography
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Acute onset of flank pain and suspicion of urinary tract stones (urolithiasis)

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Emergency Medicine

Family Practice

Internal Medicine

Nephrology

Obstetrics and Gynecology

Radiology

Urology

Intended Users

Advanced Practice Nurses

Health Plans

Hospitals

Managed Care Organizations

Physician Assistants

Physicians

Students

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of imaging modalities for patients with acute onset flank pain and suspected urinary tract stones (urolithiasis)

Target Population

Patients with suspected urinary tract stones who present with acute onset flank pain

Interventions and Practices Considered

1. Computed tomography (CT), abdomen and pelvis
    - Without contrast
    - Without and with contrast
    - With contrast
2. X-ray
    - Intravenous urography
    - Abdomen and pelvis (kidneys-ureter-bladder [KUB])
3. Ultrasound (US), color Doppler, kidneys and bladder, retroperitoneal
4. Magnetic resonance imaging (MRI), abdomen and pelvis (MR urography)
    - Without contrast
    - Without and with contrast

Major Outcomes Considered

- Utility of imaging modalities in evaluating patients with suspected urinary tract stones who present with acute onset flank pain
- Sensitivity and specificity of imaging modalities for stone detection

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Summary

Of the 70 citations in the original bibliography, 47 were retained in the final document. Articles were removed from the original bibliography if they were more than 10 years old and did not contribute to the evidence or they were no longer cited in the revised narrative text.

A new literature search was conducted in December 2013 to identify additional evidence published since the *ACR Appropriateness Criteria® Acute Onset Flank Pain-Suspicion of Stone Disease (Urolithiasis)* topic was finalized. Using the search strategy described in the literature search companion (see the "Availability of Companion Documents" field), 171 articles were found. Fourteen articles were added to the bibliography. One hundred fifty-seven articles were not used due to either poor study design, the articles were not relevant or generalizable to the topic, the results were unclear, misinterpreted, or biased, or the articles were already cited in the original bibliography.

The author added 18 citations from bibliographies, Web sites, or books that were not found in the new literature search.

Three citations are supporting documents that were added by staff.

Number of Source Documents

Of the 70 citations in the original bibliography, 47 were retained in the final document. The new literature search conducted in December 2013 identified 14 articles that were added to the bibliography. The author added 18 citations from bibliographies, Web sites, or books that were not found in the new literature search. Three citations are supporting documents that were added by staff.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Definitions of Study Quality Categories

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - The study has important study design limitations.

Category 4 - The study or source is not useful as primary evidence. The article may not be a clinical study, the study design is invalid, or conclusions are based on expert consensus.

> The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
>
> *Or*
>
> The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
>
> *Or*
>
> The study is an expert opinion or consensus document.

Category M - Meta-analysis studies are not rated for study quality using the study element method because the method is designed to evaluate individual studies only. An "M" for the study quality will indicate that the study quality has not been evaluated for the meta-analysis study.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author assesses the literature then drafts or revises the narrative summarizing the evidence found in the literature. American College of Radiology (ACR) staff drafts an evidence table based on the analysis of the selected literature. These tables rate the study quality for each article included in the narrative.

The expert panel reviews the narrative, evidence table and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the variant table(s). Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The American College of Radiology (ACR) Appropriateness Criteria (AC) methodology is based on the RAND/UCLA Appropriateness Method. The appropriateness ratings for each of the procedures or treatments included in the AC topics are determined using a modified Delphi method. An initial survey is conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. The expert panel members review the evidence presented and assess the risks or harms of doing the procedure balanced with the benefits of performing the procedure. The direct or indirect costs of a procedure are not considered as a risk or harm when determining appropriateness (additional assumptions regarding rating appropriateness can be found in the document Rating Round Information). When the evidence for a specific topic and variant is uncertain or incomplete, expert opinion may supplement the available evidence or may be the sole source for assessing the appropriateness.

The appropriateness is represented on an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate" where the harms of doing the procedure outweigh the benefits; and 7, 8, or 9 are in the category "usually appropriate" where the benefits of doing a procedure outweigh the harms or risks. The middle category, designated "may be appropriate," is represented by 4, 5, or 6 on the scale. The middle category is when the risks and benefits are equivocal or unclear, the dispersion of the individual ratings from the group median rating is too large (i.e., disagreement), the evidence is contradictory or unclear, or there are special circumstances or subpopulations which could influence the risks or benefits that are embedded in the variant.

The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating. To determine the panel's recommendation, the rating category that contains the median group rating without disagreement is selected. This may be determined after either the first or second rating round. If there is disagreement after the first rating round, a conference call is scheduled to discuss the evidence and, if needed, clarify the variant or procedure description. If there is still disagreement after the second rating round, the recommendation is "may be appropriate."

This modified Delphi method enables each panelist to articulate his or her individual interpretations of the evidence or expert opinion without excessive influence from fellow panelists in a simple, standardized, and economical process. For additional information on the ratings process see the Rating Round Information document.

Additional methodology documents, including a more detailed explanation of the complete topic development process and all ACR AC topics can be found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

The guideline developers reviewed a published cost analysis.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria (AC).

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current medical evidence literature and the application of the RAND/UCLA appropriateness method and expert panel consensus.

Summary of Evidence

Of the 82 references cited in the *ACR Appropriateness Criteria® Acute Onset Flank Pain-Suspicion of Stone Disease (Urolithiasis)* document, 81 of them are categorized as diagnostic references including 5 well designed studies 23 good quality studies, and 23 quality studies that may have design limitations. There are 30 references that may not be useful as primary evidence. There is 1 reference that is a meta-analysis study.

While there are references that report on studies with design limitations, 28 well designed or good quality studies provide good evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate radiologic examinations for patients with acute onset of flank pain and suspected urinary tract stone disease (urolithiasis)

Potential Harms

Radiography exposes the patient to less radiation as compared to CT. However, multiple radiographs can reach an exposure range similar to a low-dose CT.

Safety Considerations in Pregnant Patients

Imaging of the pregnant patient can be challenging, particularly with respect to minimizing radiation exposure and risk. For further information and guidance, see the original guideline document for the list of ACR documents related to imaging pregnant women.

Relative Radiation Level

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Contraindications

Contraindications

Intravenous urography (IVU) has a number of relative contraindications, including renal insufficiency, dehydration, past reaction to iodinated contrast agents, and pregnancy.

Qualifying Statements

Qualifying Statements

- The American College of Radiology (ACR) Committee on Appropriateness Criteria (AC) and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.
- ACR seeks and encourages collaboration with other organizations on the development of the ACR AC through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply individual or society endorsement of the final document.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Coursey Moreno C, Beland MD, Goldfarb S, Harvin HJ, Heilbrun ME, Heller MT, Nikolaidis P, Preminger GM, Purysko AS, Raman SS, Taffel MT, Vikram R, Wang ZJ, Weinfeld RM, Yoo DC, Remer EM, Lockhart ME, Expert Panel on Urologic Imaging. ACR Appropriateness CriteriaÂ® acute onset flank pain - suspicion of stone disease (urolithiasis). Reston (VA): American College of Radiology (ACR); 2015. 11 p. [82 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

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Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

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Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Urologic Imaging

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Coursey CA, Casalino DD, Remer EM, Arellano RS, Bishoff JT, Dighe M, Fulgham P, Goldfarb S, Israel GM, Lazarus E, Leyendecker JR, Majd M, Nikolaidis P, Papanicolaou N, Prasad S, Ramchandani P, Sheth S, Vikram R, Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® acute onset flank pain -- suspicion of stone disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2011. 7 p. [70 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American College of Radiology (ACR) Web site .

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2015 Oct. 3 p. Available from the American College of Radiology (ACR) Web site .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2015 Feb. 1 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Evidence table development. Reston (VA): American College of Radiology; 2015 Nov. 5 p. Available

from the ACR Web site .

- ACR Appropriateness Criteria®. Topic development process. Reston (VA): American College of Radiology; 2015 Nov. 2 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Rating round information. Reston (VA): American College of Radiology; 2015 Apr. 5 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2015 Sep. 3 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2015 Feb; 2 p. Electronic copies: Available from the ACR Web site .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 2015. 129 p. Available from the ACR Web site .
- ACR Appropriateness Criteria® acute onset flank pain — suspicion of stone disease (urolithiasis). Evidence table. Reston (VA): American College of Radiology; 2015. 26 p. Available from the ACR Web site .
- ACR Appropriateness Criteria® acute onset flank pain — suspicion of stone disease (urolithiasis). Literature search. Reston (VA): American College of Radiology; 2015. 1 p. Available from the ACR Web site .

Patient Resources

None available

NGC Status

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